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REPORT OF THE EIGHTH NORTH PACIFIC ALBACORE WORKSHOP

Edited by

S. Kume and N. Bartoo

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REPORT OF THE EIGHTH NORTH PACIFIC ALBACORE WORKSHOP

I. INTRODUCTION

The North Pacific Albacore Workshop was established in 1974, by an informal agreement between the Southwest Fisheries Center (SWFC) of the United States and the Far Seas Fisheries Research Laboratory (FSFRL) of Japan for a cooperative research program on the North Pacific albacore resource. In 1982, the Pacific Biological Station, Canada, joined the informal agreement as an additional participant in the workshop. The objective of the workshop has been to better understand albacore biology and to assess the stock status of the albacore resource in the North Pacific.

The Eighth North Pacific Albacore Workshop was held at the Far Seas Fisheries Research Laboratory, Shimizu, during September 26-29, 1983. Twenty scientists from the U.S. and Japan participated in the workshop (Appendix A). Dr. Ikuo Ikeda, director of the Far Seas Fisheries Research Laboratory (FSFRL), welcomed them in his opening address and hoped that continued research effort of the workshop would result in furthering wise utilization of the albacore resource which has been harvested internationally. The meeting was chaired by Dr. S. Hayasi of the FSFRL, who appointed several rapporteurs. A tentative agenda was discussed by the participants and accordingly revised as shown in Appendix B. Eighteen research working documents* were presented with for discussion by the participants (Appendix C).

II. BIOLOGY, ECOLOGY, OCEANOGRAPHY AND MODELING

1. Tagging

In 1982 about 1,200 tagged albacore were released in the mid- and eastern North Pacific through a continuing cooperative albacore tagging program conducted jointly by the Southwest Fisheries Center (SWFC) and the American Fisheries Research Foundation (AFRF). Tagging is currently in progress (summer of 1983) by jigboats operating in the mid-Pacific from the dateline eastward, with an objective of 1,200 releases of fish in the 6-8 kg size class. In addition, it is expected that about 200 fish will be tagged in waters close to the North American coast.

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*These papers were intended to facilitate discussion at the meeting and may be obtained by contacting individual authors directly. Reference to working papers are given in the text as NPALB/83/1-18.

Since the copperative SWFC/AFRF albacore tagging program was initiated in October 1971, approximately 21,000 fish have been tagged and released and about 1,150 tagged fish have been recovered. Between 1971 and 1980, emphasis on tagging was mostly within waters a few hundred miles off the coast of North America. In recent years, the emphasis on tagging has been in central North Pacific waters with the objectives of gathering data to learn more about the migration patterns and migration rates of albacore as they move from central to eastern North Pacific waters.

Acoustic tracking experiments were planned to be conducted during an exploratory longline cruise operation conducted in November-December 1982, however, severe weather conditions precluded the experiments. No acoustic tagging is planned for the summer of 1983, but further studies may be conducted in November-December 1983.

The Fisheries Agency of Japan conducted an albacore tagging program between 1971 and 1981 during which approximately 4,000 albacore were tagged and released, and about 200 recoveries were made. The Fisheries Agency terminated its albacore tagging program in 1982. However, prefectural agencies and the Japan Marine Fishery Resource Research Center (JAMARC) have been requested to tag incidentally caught fish. These agencies have tagged 30 or less albacore in 1982.

2. Ageing

Results were given in NPALB/83/5 from an experiment to confirm the daily formation of increments on the sagittal otoliths of North Pacific albacore, which had been tagged, released, and recaptured up to 1,142 days later. The frequency of the fine increments on albacore otoliths was determined by the injection of at the time of tagging with tetracycline which puts a fluorescent marker on the growing edge of the otoliths, and counting the number of new increments deposited on otoliths of recaptured fish during the known period of liberty. The results show that identifiable increments are deposited with a daily rhythm, but that actual counts of "daily" marks on albacore sagittae may underestimate true age by about 5% due to systematic undercounting, erosion of marginal increments during sample preparation, or interruption of the ring formation process. Results of this experiment may be extrapolated to count "daily" increments on whole otolith of albacore sagittae to estimate absolute age (in days). The conversion factor, corrected for statistical bias is a multiplier of 1.05. This factor may be applied confidently to North Pacific albacore in the range of 50-100 cm FL.

The age and growth of North Pacific albacore determined from tag returns and daily increments on otoliths was reported in NPALB/83/1. In this work, the absolute ages of a sample of albacore was estimated by counting verified "daily" increments on sagittal otoliths. This information was combined with tag recapture statistics on other fish to estimate parameters of the von Bertalanffy growth function, and to compute expected lengths at various ages for two groups of albacore. One group consists of those fish supporting the albacore fisheries in the eastern Pacific between latitude 10N and 40N, which is referred to the 'south stock.' The other group is the albacore contributing to fisheries north of latitude 40N (the so-called 'north stock'). The results indicate that North Pacific albacore have an expected

length of 35-38 cm at an age of 1 year, but that growth rates of older albacore may differ between two hypothesized subpopulations.

The estimated growth curves were used to interpret accumulated length-frequency data for albacore caught in the eastern Pacific by U.S. jig boats. In particular, inferences were made concerning birth date distributions. If the growth models are correct, this analysis suggests that the hypothesized 'north' and 'south' subpopulations have birth date distributions centered approximately 6 months apart.

3. Oceanographic Research Including Satellite Applications and Sonic tracking

The migration, distribution, availability and vulnerability of albacore are markedly influenced by oceanographic conditions in the North Pacific, notably hydrographic fronts. For example, albacore fishing grounds in the western Pacific have been linked to oceanic fronts in the region of the Kuroshio Current and Kuroshio Extension waters. Seasonal migration into North American coastal waters is associated with the Transition Zone and its frontal boundaries. Coastal upwelling fronts and fronts at the margin of river plumes influence local concentrations and movements of albacore in U.S. coastal waters. U.S. albacore fishermen traditionally fish blue, oceanic waters warmer than 15°C and near fronts indicated by temperature or water color "breaks." Optimum temperature ranges for albacore catch have been determined from commercial or research vessel catches and sea surface temperature measurements. However, documentation of an association between albacore and thermal or color fronts has not been possible due to the difficulty of obtaining concurrent catch and hydrographic data covering sufficiently large areas.

Since 1978 earth-orbiting satellites have provided data yielding images of sea surface temperature and the turbidity and phytoplankton pigment concentration of near-surface waters over large areas of the ocean. Some of these data are used to provide U.S. west coast fishermen with sea surface temperature and ocean color boundary charts. Results given in NPALB/83/9 show that environmental features observed in satellite infrared and color images of the sea surface correspond to boundaries for albacore aggregations and fishing regions as indicated by daily catch data obtained from logbook records kept by U.S. jig fishermen.

In near shore regions off the coast of North America commercially fishable aggregations of albacore are found in warm, blue oceanic waters near temperature and color fronts on the seaward edge of coastal water masses. Relatively intense fronts are favored, such as those associated with persistent upwelling. Shoreward intrusions of oceanic water are particularly favorable sites for albacore aggregation.

In offshore waters during late summer, commercial concentrations of albacore are found associated with hydrographic boundaries which are marked by color fronts detectable from statellites, but lack temperature gradients. The availability of albacore in offshore waters appears to be higher in relatively productive waters. The temperature signature denoting the boundaries of the relatively more productive waters, if present earlier, may be lost due to

seasonal warming. However, the color gradient pattern is conserved.

Explanations for the environmental preferences of albacore are changing as new knowledge is acquired. Past studies stressed confinement to a physiologically optimum temperature range or utilization of frontal gradients for thermoregulation. However, temperature by itself cannot explain distributions observed off North America. Recent evidence based on acoustic tracking experiments conducted in conjunction with vertical temperature measurements show that albacore move vertically through the thermocline and experience temperature changes of 5°C or more in 10-30 minute periods.

4. Stock Structure

Results given in NPALB/83/1 provided the basis for much of the discussion on stock structure. The growth models estimated in NPALB/83/1, based on verified otolith readings and carefully screened tag return statistics support the hypothesis that the North Pacific albacore population is not homogenous, but consists of subpopulations exhibiting different, possibly overlapping, biological characteristics. The original distinction was made on the basis of migration patterns. Further evidence of heterogeneity was suggested on the basis of tag returns which indicate that proposed "north" and "south" subpopulations of North Pacific albacore have different growth rates. The analysis reported in NPALB/83/1 based jointly on otolith data, tag return statistics, and length frequency distributions gives further support to the multi-stock hypothesis in that the two proposed substocks may have more or less distinct spawning seasons.

NPALB/83/7 discussed the planned use of endonuclease analysis of mitochondrial DNA for investigating intraspecific variation within the North Pacific albacore population. Preliminary results from studies dealing with chromosomal analysis of albacore, an additional biochemical approach being used to investigate possible genetic variability in the North Pacific albacore were given in NPALB/83/3.

An important point made during the discussion on stock structure is that the proposed substocks may not be genetically isolated, but instead are mixing fishery stocks, overlapping for portions of their life histories.

5. Pacific Albacore Simulation Model

Since late 1980, the Southwest Fisheries Center has been developing a simulation model for the North Pacific albacore population. The model is intended to function as a vehicle for organizing information and testing hypotheses on population dynamics and the effects of environmental variables.

A progress report NPALB/83/8 described the albacore model as it was in April 1983, discussed the methods used for estimating important parameters and described the implementation of the model on a main frame computer. It was pointed out that the formulation of the model is the same as described previously (see reports of 1981 and 1982 workshops), and the parameters previously reported have been retained. A major change in the model project is the intended implementation on a microcomputer. Logistics and cost

problems constrained use of the main frame computer and severely hampered additional rapid model development. Consequently, the model is being restructured to operate on a micro-computer. Some penality in speed of computation is expected, however, overall progress should increase.

The discussion by the participants indicated that considerable effort was going into preparation of environmental data and data bases. Again, all participants were encouraged to collaborate on aspects of research related to development of environmental inputs to the model.

III. REVIEW OF CURRENT FISHERIES

1. U.S. Fishery

a. Jig/Bait Fishery

The 1982 U. S. albacore fishery was reviewed in NPALB/83/2, and a summary of fishery data for the 1982 fishery was given in NPALB/83/11. The total landings at the canneries for 1982 are estimated to be 6,648 MT. In addition, about 1,000 MT were sold fresh or frozen by fishermen and not reported in the landings statistics. The sum is less than half the 1972-81 average of 18,228 MT and the lowest since 1952. About one-third of the landings were made by jigboats fishing in the central North Pacific.

A major factor contributing to the low landings in 1982 was the inability of fishermen to readily sell their catches. Initially, a contract was negotiated with canneries on the west coast of the U.S. and Hawaii to pay U.S. $1,570 per MT of albacore delivered to the canneries. However, because of excess inventories of canned and/or raw albacore in the domestic market or availability of less expensive albacore in world markets, only one cannery in southern California was buying albacore in late August, and no buying stations were operated along the coast. The unloading process at the cannery in southern California took long periods of time which delayed boats in returning to the fishing grounds and caused fishermen, in part, to sell their catches directly to the public off their vessels. Poor weather conditions also hampered fishing off central California during much of the 1982 fishing season.

b. Longline Fishery

Exploratory longline fishing operations for albacore were conducted by five chartered U.S. fishing vessels during November-December 1982 in an area centered about 1,500 miles west of Point Conception, California (reported in NPALB/83/10). This was the third exploratory longline cruise conducted to evaluate the feasibility of a U.S. albacore fishery operating during winter months as an alternative to other winter fisheries or remaining idle.

2. Japanese Fishery

a. Pole-and-line fishery

The 1983 summer albacore pole and line fishery catch was lower than in the previous year at about 20,000 MT. Relatively good catches were made over the oceanographic frontal zone but elsewhere fishing was poor. The fishery started near Japan in the Nishinoshima area in late March with a poor catch rate of 0.5-5.5 MT per day. As usual, fish over 90 cm predominated in the catch. The frontal fishing ground was active especially during the latter part of the season, with a catch rate of 2-12 MT per day. The catch was mostly composed of 3 year old fish. The large cold water ring around the Izu Islands caused very poor fishing in this area this season. Good fishing grounds were formed east of the Izu Islands around the boundary between the second branch of the Oyashio and the Kuroshio extension. Four year old albacore predominated in the catch.

b. Longline Fishing

Longline fishing grounds were formed in areas of 33°-36°N, 150°-170°E and 30°-35°N, 150°-170°W in the fall of 1982 and succeeding winter months. Fishing grounds in the western area shifted southwesterly and reached the east side of the Izu Islands by the end of December 1982. In January 1983, fishing grounds extended to the west of the Izu Islands (27°-31°N, 135°-140°W). Around the Izu Islands in mid-January, the catches were principally composed of 3-4 year old fish. From mid-February to mid-March, the hook rate of the longline fishing was 1.3-3.0%. The 1981 longline catch (17,900 MT) was higher than the catch in 1980 (14,700 MT).

c. Drift Gillnet Fishery

Few details of the drift gillnet fishery are available. The number of gillnet fishing vessels over 100 gross tons fishing for albacore in the North Pacific Ocean increased from 103 in 1980 to 146 in 1981. The catches from the gillnet fishery are very seasonal with April to September being the good fishing months. In 1982, many gillnet vessels switched from the albacore to squid fishing due to the high squid prices and low albacore prices during the period of high albacore catches. So, the gillnet catch in 1982 is to be smaller than the estimated 1981 catch of 17,500 MT.

IV. CURRENT APPRAISAL OF THE STOCK

1. Application of Size Data

For age structured stock assessment methods to be effective sampled length frequencies must accurately reflect the catch from which they are sampled and sufficient numbers of samples are needed to assure that minimum bias results from substitution of length frequencies in the analysis. Two papers, NPALB/82/6 and 16, dealt with these points.

The question of accurately sampling catch for length composition was discussed in NPACB/83/6. Simulation results showed that when variation in fish size is larger among vessels than within vessels (as is the case in the U.S. troll fishery) much more accurate length frequency results are obtained by increasing the number of vessels sampled rather than increasing the number of samples per vessel. Participants indicated that the pattern of greater variation among vessels than within vessels was also true for the Japanese fisheries.

The problem of substitution of existing length frequencies for missing length frequencies when estimating the overall size composition of a fishery was discussed in NPALB/83/16. A hierarchy of substitutions, based on biological knowledge and previous sampling results was presented and demonstrated. However, even when a carefully designed substitution procedure is used, the resulting estimated catch size may be biased due to inadequate numbers of length frequency samples. An example of one quarter of longline size frequency data was used to illustrate the point. Careful examination of intermediate results when using size frequency data in assessments was urged.

2. Catch, Effort and C/E Trends

a. Catch Trends

Annual albacore catches in the North Pacific are shown by gear and country for the years 1952-1982 in Table 1 and Figure 1. The total catches followed an upward trend since the early 1960's (from the 55,000 MT level), peaking at a record catch of 124,000 MT in 1976. Since 1976 catches have generally declined. Catches of the recent 3 years, 1979-1981, are low, between 70,000 and 80,000 MT.

The rise of the catch in middle 1970's was due primarily to the increase (from 50,000 to 85,000 MT) in the Japanese pole-and-line catch. In 1981 and 1982, the pole-and-line fishery recorded the lowest catches (26,000-27,000 MT) since 1971. The annual Japanese longline catches historically have not varied greatly in tonnage. Since 1952 the catches have ranged from a low of 10,000 MT to a high of 29,000 MT; a three-fold change. Since 1970 the longline catches ranged between 10,000-18,000 MT. Recently the developing Japanese drift gillnet fishery (OME-AMI) experienced sudden increase in albacore catch to 18,000 MT in 1981 from 3,000 MT in 1980. Until 1972, albacore catches by the North American Surface Fishery were rather stable. Since 1972 catches have tended downward. In 1979 and 1980, the fishery recorded the lowest catches since 1952 of 7,000-8,000 MT. The catch was up in 1981 to 16,000 MT but was again low in 1982 at about 7,500 MT.

b. Effort Trends

Trends in effort are available for the Japanese longline and pole-and-line fisheries as well as for the United States troll fishery (Table 2).

The Japanese longline fishery effective effort has been erratic since 1952. In general, effective longline effort increased from 200 million hooks to 455 million hooks from 1952 to 1960. Subsequent to 1960 dropped to below 300 million hooks from 1963 through 1966 rising in 1967 to over 430

million hooks. Effort generally declined from 1967 to 1975 to about 160 million hooks. From 1976 to 1981 effective effort has gradually increased to about 280 million hooks.

Japanese pole-and-line effort showed a gradual increase from 4,000 fishing days in 1961 to about 7,000 fishing days in 1971. Effort increased rapidly from 1972 to 1978 when a peak of 17,000 fishing days was reached. Effort has shown a decline since 1978 to about 9,000 fishing days in 1981.

Effective effort in the U.S. troll fishery increased from 25,000 vessel days in 1961 to about 67,000 days in 1972. From 1973 to 1978 effort was lower, in the 30,000 to 40,000 day range. From 1979 to 1982 effort has declined to about 20,000 fishing days.

As shown in Table 3, the number of Japanese pole-and-line vessels in the fishery has decreased in the last few years. Most of the decline is in large vessels, which catch about 80% of the pole-and-line albacore catch.

c. Catch Rate Trends

Historical catch per effort (CPUE) data are available for the Japanese longline and pole-and-line fisheries as well as for the United States troll fishery (Figure 2). All three major fisheries show a long term decline in CPUE. The decline in pole-and-line CPUE began in 1975, and the current CPUE is about 1/2 of the CPUE prior to 1975. The decline in the CPUE of the longline fishery has been approximately 30% between 1966 and 1980. However, several years of high CPUE have made the decline somewhat erratic. The North American Troll Fishery has shown a long term decline of about 30% since about 1963, but, as is the case with other fisheries, higher CPUE in some years make the trend erratic.

3. Condition of the Stock

The current assessment of the condition of the North Pacific albacore stock is based on examination of trends in CPUE, specific stock assessment results and previous works.

The results of production model analysis (NPACB/83/15) are based on the longest and most complete data series available. Assuming a single, unit stock, MSY estimates range from 90,000 MT to 155,000 MT, depending on the shape of the equilibrium yield-effort relationship. This range of MSY values is consistent with results presented at previous workshops. This indicates that the present harvest level is apparently below the estimated range of MSY values. There are, however, some very critical assumptions which must be made to apply the production model to North Pacific albacore data, and it is evident that all these assumptions are not fully met. Hence, there may be unknown substantial bias or error in the MSY values reported.

The results of a cohort analysis (NPALB/83/12) were presented and discussed. These results indicated that the stock size is approximately 2/3 of its size in the early 1970's. This analysis also requires many assumptions which are not fully met. However, the results are consistent with previous analyses.

Based on current and past analyses plus available statistics, the North Pacific albacore if viewed as a single stock appears to be moderately exploited at levels which appear to be sustainable. However, because of problems fully satisfying the assumptions needed in various analyses plus the likelihood of increased catches from new, expanding fisheries, the stocks should be watched carefully. Particular attention should be paid to catch-per-effort indices in established fisheries which are the most rudimentary indicator of stock abundance if viewed over a long time period.

Producing a reliable assessment of the North Pacific albacore resource remains a difficult task. The expansion of present assessments to various multi-stock hypotheses compounds the assessment problems but must be dealt with as additional accuracy is required. Further, some indicators of the stocks' condition such as recruitment have not yet been dealt with. Application of robust assessment methods appears to be an absolute necessity.

V. RECOMMENDATIONS

A number of recommendations resulted from the workshop discussions. The following should be undertaken:

A. Statistics Improvement

1. Fishery data, catch, catch-per-effort and catch size composition data for the expanding Japanese drift gillnet fishery (OME-AMI) and for albacore caught by the squid gillnet fishery should be obtained. Efforts to secure this data are underway and should be continued.

2. Coverage of U.S. albacore data which appears to be improving should be increased. Emphasis should be given to the offshore catch.

3. Canadian albacore fishing data should be gathered and supplied in time for inclusion in the general assessment of the North American Fishery.

4. Statistics on the operation of Korean and Taiwan tuna boats, especially drift gillnet vessels, should be investigated and data secured.

5. Statistical coverage and explanation of the condition of the U.S. baitboat fishery should be improved and presented.

B. Stock Structure

1. Bio-chemical investigations of stock structure should be continued and reported.

2. Analytical and simulation modelling should be continued to examine the consistency of stock structure hypotheses with fishing data.

3. The oceanographic mechanisms that may cause stock separation should continue to be examined.

4. Evaluation of combined Japanese and United States tag data should be undertaken in the near future.

C. Biology

1. Age and growth should be examined by otolith and tagging data. Results should be stratified by area.

2. Spawning areas and spawning seasons should be identified and reported.

3. Physiology studies and further work with remote sensing tags are encouraged as a means of improving understanding of albacore behavior.

4. Tagging of albacore in the Central and Western Pacific should be continued and expanded.

D. Stock Assessment

1. Production model analyses should be continued.

2. Yield-per-recruit analyses using revised age structures should be computed.

3. Simulation model analyses should be continued to test hypotheses critical to other analyses.

4. Some form of spawner-recruit analysis for the stocks should be undertaken.

5. Assessments should consider the possibility of more than one stock in the North Pacific.

E. Ocean Environment

1. Oceanographic studies to identify and quantify key processes affecting the albacore fisheries should be continued for input into simulation studies.

2. Extended application of satellite remote sensing data to fisheries applications should be continued.

VI. ARRANGEMENT FOR NEXT WORKSHOP AND ADJOURNMENT

In keeping with past workshop practices, the Southwest Fisheries Center proposed to host the Ninth North Pacific Albacore Workshop in La Jolla, and participants accepted the offer. As to the timing of the meeting, FSFRL suggested the date of January 1985, which will be finalized later by correspondence together with details for the meeting.

The prepared draft report of the workshop would be published after further review. The meeting was adjourned.

Table 1. Catches for North Pacific albacore in metric tons, 1952-1982.

Year	Japan					Taiwan	United States				Canada	
	Pole-and-line	Long-line	Gill-net	Other gear	Total	Longline	Baitboat	Jigboat	Sport	Total	Jigboat	Grand Total
1952	41,386	26,687		237	68,710			23,843	1,373	25,216	71	93,997
1953	32,921	27,777		132	60,830			15,740	171	15,911	5	76,746
1954	28,069	20,958		38	49,065			12,246	147	12,393		61,458
1955	24,236	16,277		136	40,649			13,264	577	13,841		54,490
1956	42,810	14,341		57	57,208			18,751	482	19,233	17	76,458
1957	49,500	21,053		151	70,704			21,165	304	21,469	8	92,181
1958	22,175	18,452		124	40,731			14,855	48	14,903	74	55,708
1959	14,252	15,502		67	30,121			20,990	0	20,990	212	51,323
1960	23,156	17,369		76	42,601			20,100	557	20,657	5	63,263
1961	18,636	17,437		268	36,341		2,837	12,054	1,355	16,246	4	52,591
1962	8,729	15,764		191	24,684		1,085	19,753	1,681	22,519	1	47,204
1963	26,420	13,464		218	40,102		2,432	25,142	1,161	28,735	5	68,812
1964	23,858	15,458		319	39,635	26	3,411	18,389	824	22,624	3	62,283
1965	41,491	13,701		121	55,313	16	417	16,461	731	17,609	15	72,953
1966	22,830	25,050		585	48,465	16	1,600	15,169	588	17,357	44	65,882
1967	30,481	28,869		520	59,870	17	4,113	17,814	707	22,634	161	82,682
1968	16,597	23,961		1,109	41,667	15	4,906	20,441	951	26,298	1,028	69,008
1969	32,107	18,006		1,480	51,593	21	2,996	18,826	358	22,180	1,365	75,157
1970	24,376	15,372		956	40,704	23	4,416	21,039	822	26,277	354	67,358
1971	53,198	11,035		1,262	65,495	24	2,071	22,496	1,175	25,442	1,587	92,548
1972	60,762	12,649	1	921	74,333	25	3,750	23,600	637	27,987	3,558	105,903
1973	69,811	16,059	39	1,883	87,792	35	2,236	15,652	88	17,976	1,270	107,073
1974	73,576	13,053	224	1,065	87,918	40	4,777	20,177	739	25,693	1,207	114,858
1975	52,157	10,060	166	402	62,785	28	3,243	18,926	1,243	23,412	101	86,326
1976	85,336	15,896	1,070	1,394	103,696	37	2,700	16,314	766	19,780	252	123,765
1977	31,934	15,737	688	1,039	49,398	561	1,497	10,012	619	12,128	53	62,140
1978	59,877	13,061	4,029	3,209	80,176	53	950	15,700	871	17,512	23	97,773
1979	44,662	14,249	2,856	1,280	63,047	81	303	6,253	75	6,631	289	70,050
1980	46,743	14,660	2,986	1,516	65,905		382	7,599	174	8,155	212	74,355
1981	27,426	17,876	17,425	959	63,686		-	-	-	15,838	200	79,724
1982	26,000	-	-	-	-		-	-	-	7,648	103	-

Remarks:

1. Figures for 1982 are preliminary.
2. Japanese longline catches for 1952-60 exclude minor amounts taken by vessels under 20 gross tons. Longline catches in weight are estimated by multiplying annual number of fish caught by average weight statistics.
3. Japanese pole-and-line catches include catches by research vessels.
4. United States jigboat catches include minor amounts taken by baitboats not submitting logbooks.
5. Jigboat catches for years 1952-60 include baitboat catches.
6. United States sport catch is a minimum estimate based on partial coverage.
7. Grand totals omit unknown but minor catches by longline and pole-and-line vessels of the Republic of Korea for the years until 1979.
8. 1982 U.S. catch includes estimated 1,000 MT sold for fresh consumption.
9. Grand total for the years 1980 onward excludes Taiwan and Korea catches, which are estimated to be minor.

Table 2. Estimated effective effort by fishery for North Pacific albacore in years 1952-1982.

Year	Japan Longline (hooks x 10^6)	Japan[1] Pole-and-line (days)	(poles x 10^3)	U.S.[1] Effort (days)
1952	283.0			
1953	311.1			
1954	409.6			
1955	395.3			
1956	389.1			
1957	346.4			
1958	384.3			
1959	373.7			
1960	455.5			
1961	432.0	4,235		25,255
1962	309.0	1,209		27,464
1963	259.0	4,200		31,456
1964	232.4	3,478		30,355
1965	242.7	6,628		24,945
1966	276.8	3,843		25,756
1967	434.8	5,005		26,453
1968	355.8	3,108		29,175
1969	361.2	6,447		28,528
1970	253.2	3,958		20,165
1971	255.2	7,631		44,015
1972	186.7	9,695	227.8	67,319
1973	173.5	12,685	287.8	32,031
1974	153.8	9,421	226.4	39,748
1975	158.1	8,766	204.5	35,449
1976	227.2	13,921	278.9	38,445
1977	256.2	10,609	203.4	32,292
1978	252.8	16,725	321.9	32,111
1979	278.7	12,761	252.3	17,924
1980	203.0	10,528	-	28,418
1981	280.4	8,992	-	20,945
1982				18,167

[1]Japanese pole-and-line days are not the same as U.S. effort days.

Table 3. Number of Japanese pole-and-line vessels by size.

Year	Total Number	Size of Vessel (gross tons)				
		<20	20-50	50-100	100-200	200>
1961	5523	5046	141	132	178	26
1962	4460	4009	186	111	126	28
1963	6533	6041	240	111	112	29
1964	4361	3829	291	103	106	32
1965	4226	3654	298	91	148	35
1966	4191	3620	299	71	167	34
1967	4114	3550	296	54	173	41
1968	3231	2670	276	60	170	55
1969	4008	3475	242	71	158(2)	56(3)
1970	3666	3148	220	91	143(3)	64(3)
1971	3684	3168	165	133	132(3)	86(3)
1972	4156	3596	131	162	119(3)	148(3)
1973	3587	2998	93	211(1)	83(3)	202(3)
1974	3941	3225	136	269	84	227
1975	3344	2648	95	283	39	279
1976	3754	3101	51	318	17	267
1977	4010	3348	40	348	14	260
1978	3680	3035	26	358	10	251
1979	4105	3480	14	370	13	228
1980	3804	3232	14	350	10	198
1981	3612	3064	10	353	6	179

( ) shows the number of prefectural research vessels included.

Table 4. Actual CPUE[1] statistics for major North Pacific albacore fisheries, 1981-1980.

Year	Fishing days	Japan Pole-and-line Poles	United States jig	Japan Longline "Young" area(2)	Japan Longline "Main spawning" area(3)	Japan Longline Entire area(4)
1961	4.40		69.17	0.55	0.14	0.25
1962	7.22		124.59	0.67	0.14	0.30
1963	6.29		132.09	0.68	0.19	0.32
1964	6.86		97.61	0.90	0.19	0.40
1965	6.26		89.07	0.70	0.25	0.33
1966	5.94		90.45	1.20	0.27	0.54
1967	6.09	259	126.83	0.88	0.29	0.40
1968	5.34	227	135.23	0.84	0.29	0.38
1969	4.95	211	112.57	0.60	0.31	0.28
1970	6.13	261	127.39	0.66	0.27	0.31
1971	6.94	295	96.68	0.43	0.22	0.21
1972	6.25	266	61.08	0.63	0.30	0.30
1973	5.49	242	82.89	0.85	0.30	0.38
1974	7.81	325	105.17	0.64	0.30	0.34
1975	5.98	255	99.81	0.46	0.21	0.23
1976	6.13	306	69.22	0.66	0.21	0.30
1977	3.01	157	59.90	0.60	0.14	0.26
1978	3.58	186	86.80	0.52	0.17	0.23
1979	3.50	187	45.41	0.53	0.21	0.24
1980	4.44	268	36.78	0.72	0.26	0.33
1981	3.05	-	80.11	0.68	0.32	0.31
1982	3.68	-	62.00	-	-	-

[1]Unit: MT/vessel-day and kg/pole-day for Japan pole-and-line; fish/vessel-day for United States jig; fish/100 hooks for Japan longline

(2) "Young" area is 25°-45°N from October to March and 30°-45°N
(3) "Main spawning" area: 10°-25°N
(4) Entire area: 0°-45°N

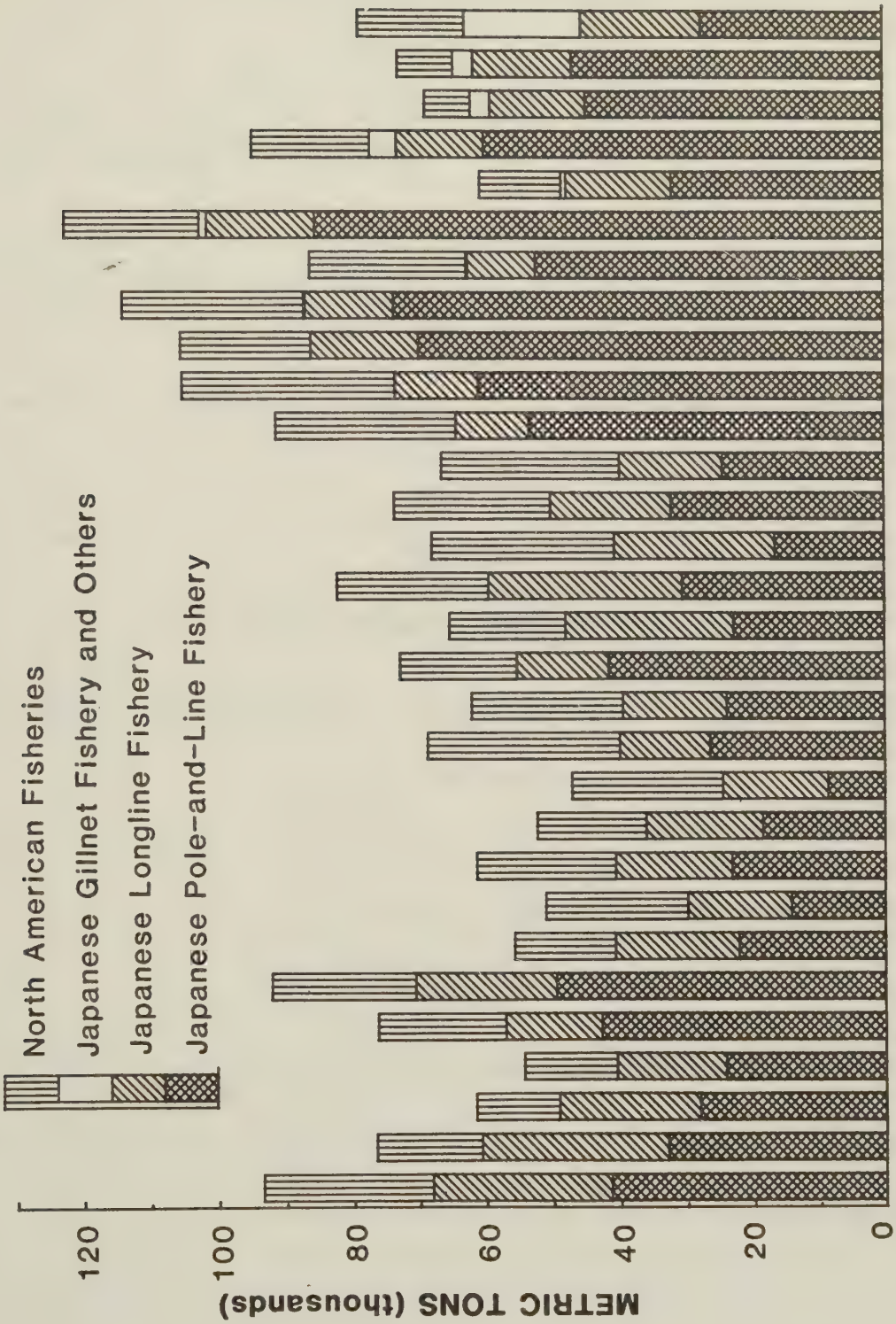

Figure 1. Annual catches of North Pacific albacore by country and gear, 1952-1981.

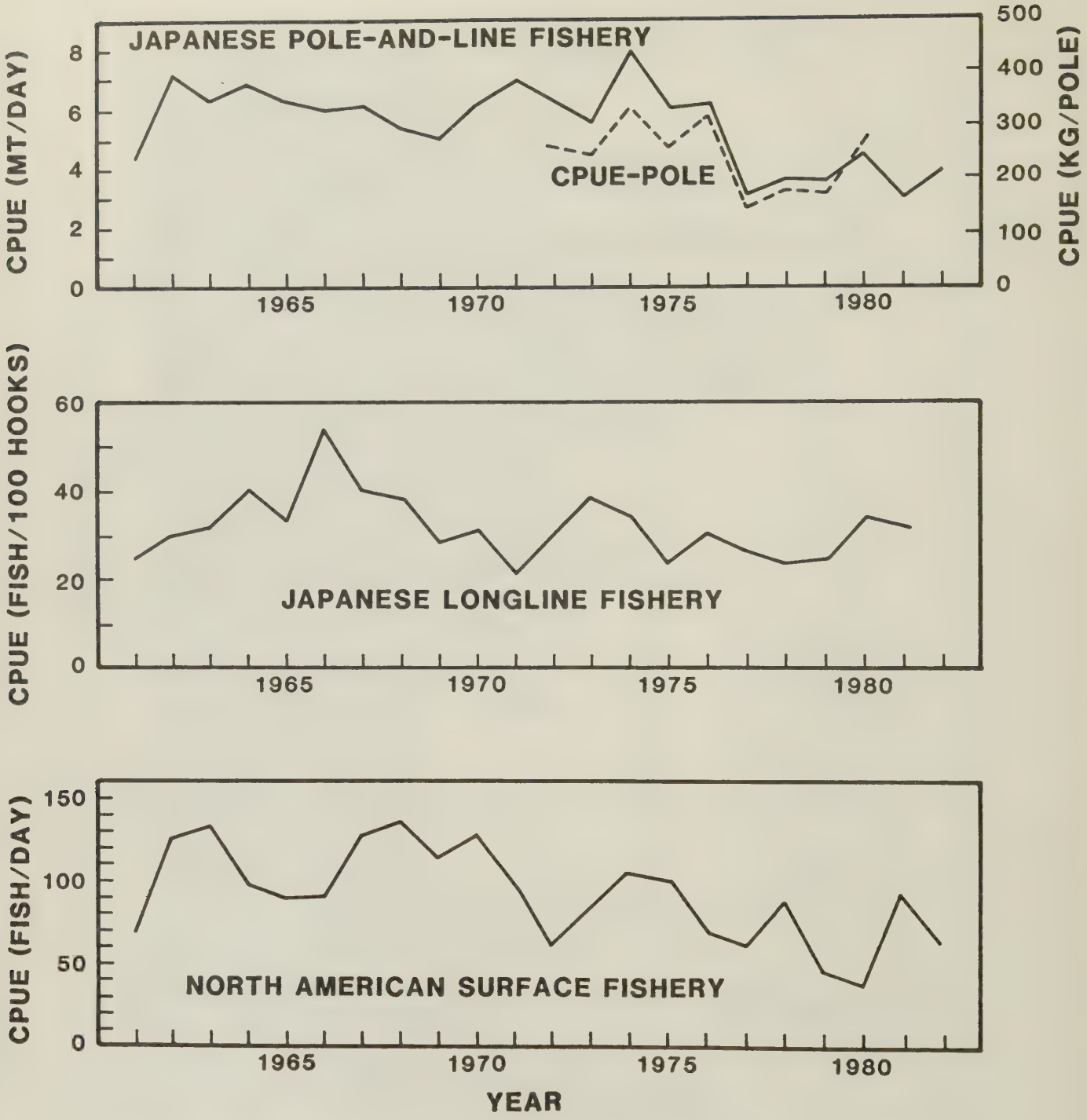

Figure 2. North Pacific albacore catch-per-unit effort (CPUE) by fishery and gear.

APPENDIX A

EIGHTH NORTH PACIFIC ALBACORE WORKSHOP

PARTICIPANTS LIST

September 26-29, 1983

Norman Bartoo	-	Southwest Fisheries Center, La Jolla, Calif.
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Ichiro Yamanaka	-	Japan Fisheries Information Service Center, Tokyo
Chihiro Okazaki	-	Interpreter from Inter Group, Tokyo

APPENDIX B

EIGHTH NORTH PACIFIC ALBACORE WORKSHOP

AGENDA

September 26-29, 1983

September 26 (Mon)

10:00 a.m.
1. Opening of meeting
2. Selection of chairman
3. Adoption of Agenda
4. Rapporteurs nomination

10:30 a.m.
5. Brief introduction of working papers by authors

- Break for Lunch -

1:15 p.m.
6. Albacore biology and ecology
   a. Tagging
   b. Ageing
   c. Food habits
   d. Stock structure
   e. Others

September 27 (Tue)

9:00 a.m.
7. Albacore oceanography
   a. Relation of oceanographic condition to stock behavior
   b. Albacore modeling relevant to oceanography
8. Results of albacore simulation modeling
   - progress and results -

- Break for lunch -

1:15 p.m.
9. Review of current fisheries and data
   a. National fisheries
      Japan - USA - Canada - Other countries
   b. Exchange of data

September 28 (Wed)

9:00 a.m.
10. Stock condition
    a. Decomposition of length data to age
    b. Trend of fishery data
    c. Appraisal of stock status

- Break for Lunch -

1:15 p.m.
11. Recommendations
12. Other matters

- Time for drafting -

September 29 (Thr)

Morning
- Visiting fishing port - (tentative and optional)

1:15 p.m.
13. Review of draft report
14. Future arrangement
15. Adjournment

APPENDIX C

EIGHTH NORTH PACIFIC ALBACORE WORKSHOP

LIST OF WORKING PAPERS

NPALB/83/1 Laurs, R. M., R. Nishimoto, J. H. Uchiyama and J. A. Wetherall. Age and growth of North Pacific albacore, Thunnus alalunga, determined from tag returns and daily increments on otoliths.

" 2 Nishimoto, R. N. and R. M. Laurs. Review of U.S. albacore fishery in 1982.

" 3 Ratty, F. J., R. M. Laurs and S. Yun-chun. Chromosomal analysis of the albacore, Yellow-fin, and Skip-jack tunas.

" 4 Herrick, Jr. S. F. 1982-83 U.S. albacore trade summary.

" 5 Laurs, R. M., R. Nishimoto and J. A. Wetherall. Experimental verification of daily increment formation on sagittal otoliths of albacore, Thunnus alalunga.

" 6 Bartoo, N. and A. Coan. Effects of sample size on length-frequency sampling.

" 7 Graves, J. E. and A. E. Dizon. Population structure of the North Pacific albacore as determined by restriction endonuclease analysis of mitochondrial DNA: A progress report.

" 8 Weber, E. Status report for the North Pacific albacore model as of April 1983.

" 9 Laurs, R. M., P. C. Fiedler and D. R. Montgomery. Albacore tuna catch distributions relative to environmental features observed from satellites.

" 10 Laurs, R. M. and R. C. Dotson. Exploratory longline fishing for albacore tuna in Eastern North Pacific waters during November-December 1981.

" 11 Majors, A. P., A. L. Coan, Jr., N. Bartoo and F. Miller. Summary of the 1982 North Pacific albacore fishery data.

" 12 Naganuma, A. The trend of the resources of albacore caught by pole-and-line fishery in the Northwestern Pacific.

" 13 Yasui, M. Food habits of albacore in the Northwest Pacific. (Results of co-operative research by Japanese tuna research cruises in 1982 and 1983.)

" 14 Shiohama, T. Review of the current Japanese North Pacific albacore fisheries, 1983.

" 15 Shiohama, T. A brief stock assessment of North Pacific albacore by generalized production model, 1961-1981.

" 16 Shiohama, T. Estimation of catch by age of the North Pacific albacore caught by Japanese longline fishery (Preliminary).

" 17 Japan Marine Fishery Resource Research Center. Catches of albacore by drift gillnet in the North Pacific Ocean, 1980-82.

" 18 Bartoo, N. and S. Kume. Report of the seventh North Pacific albacore workshop.